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NEW TYPE 125
FUSED QUARTZ

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HIGH QUALITY, ECONOMICAL MATERIAL FOR COMMERCIAL, OPTICAL AND MIRROR APPLICATIONS

LAMP GLASS DEPARTMENT
GENERAL ELECTRIC
MANUFACTURERS OF LUCALOX® CERAMIC—ELECTRONIC GLASSWARE—
FUSED QUARTZ PRODUCTS—JET-TEMP® AND JET-B.O.P. THERMOCOUPLES

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TYPE 125 FUSED QUARTZ was developed as the result of intensive research at General Electric's Lamp Glass Department. It features the absence of large bubbles, has low stress birefrigence and high transmission in both the ultraviolet and infrared wavelengths.

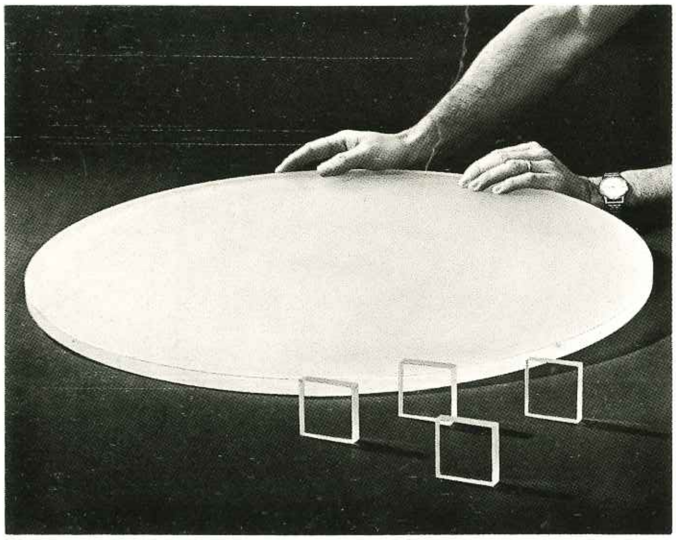
Type 125 is the ideal economical material for commercial, optical and mirror applications. It provides significant economies where a more expensive material is being used **only** to obtain minimum bubble size.

Price

Type 125 fused quartz is competitively priced not only with lower commercial grades of fused quartz but in many instances it is priced lower than materials of comparable quality. It is especially economical in situations where Type 125 can now be used in place of more expensive grades where bubble size alone is the determining criterion.

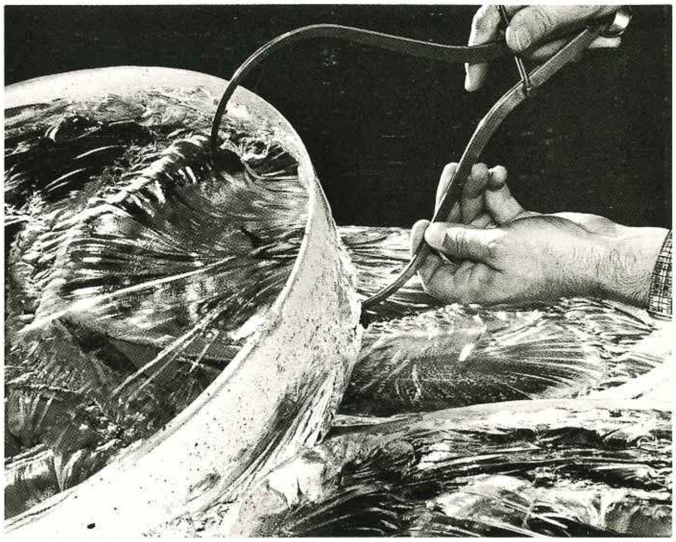
Bubble Size

As shown in the accompanying photo, absence of large bubbles is a distinguishing characteristic of Type 125. This is again demonstrated in the chart of bubble sizes on page 3.



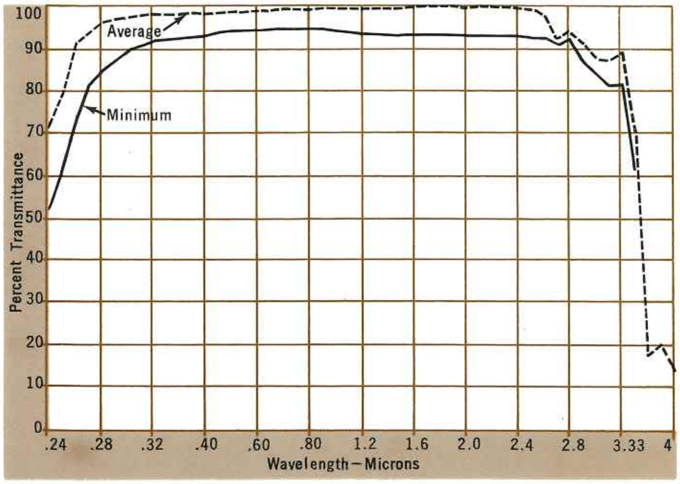
Availability

Type 125 fused quartz is available in single piece solids up to 38 inches diameter and 6 inches thick. Single ingots are free from interfaces. Large blanks can be fabricated by fusing multiple pieces with high joint quality. Ground and polished disks and plates can be supplied in any shape. The material can be finished to customer requirements.



Transmission Properties

Type 125 has high transmission in both UV and IR wavelengths. Light transmission properties of the material are shown in the curve.



Note changes in wavelength scale.
Transmittance Curve of Type 125 Fused Quartz for 1 cm thickness (Excluding surface reflection losses).

Applications

Type 125 is ideally suited for use as mirrors, windows, lenses, domes, plates, solar cell covers, material for laboratory use, optical flats, stock for slice racks, boats, infrared windows, epitaxial plates and any application where high quality and low cost fused quartz is required.

This new material can be used in place of any commercial grade now being used and, in addition, can many times be used in applications where more expensive grades are required because bubble size restrictions dictate a higher grade material.

PHYSICAL PROPERTIES OF GENERAL ELECTRIC TYPE 125 FUSED QUARTZ

Density	2.2 g./c.c.
Hardness	4.9 (Mohs')
Tensile Strength	7,000 p.s.i.
Compressive Strength	> 160,000 p.s.i.
Bulk Modulus	(approx.) 5.3x10^6 p.s.i.
Rigidity Modulus	4.5x10^6 p.s.i.
Young's Modulus	10.4x10^6 p.s.i.
Poisson's Ratio	.16
Coefficient of Thermal Expansion	(av.) .55x10^{-6} cm./cm./°C. $\left\{ \begin{matrix} 20^\circ\text{C.} \\ 320^\circ\text{C.} \end{matrix} \right.$
Thermal Conductivity	.0033 g. cal./cm.^{2}/sec./°C./cm.
Specific Heat	.18 g. cal./gm.
Fusion Temperature	(approx.) 1800°C.
Softening Point	(approx.) 1670°C.
Annealing Point	(approx.) 1140°C.
Strain Point	1070°C.
Electrical Resistance	9.5 $\log_{10}$ R for cm.^{3} at 350°C.
Dielectric strength volts/mil.	400-410 (20°C. 1 Mc.)
Dielectric Constant	3.75 at 20°C. 1 Mc.
Dielectric Loss Factor	less than .0004 at 20°C. 1 Mc.
Specific Resistivity OHMS/CM^3 MIN	10^{18}
Dissipation Factor	less than .0001 at 20°C. 1 Mc.
Index of Refraction	1.4585
Velocity of Sound—Shear Wave	3.75x10^5 cm./sec.
Velocity of Sound–Compressional Wave	5.90x10^5 cm./sec.
Sonic Attenuation	less than .033 db/ft./mc.
Max. Birefrigence	20 mu/cm. While this is maximum, the majority of material will fall below 10 mμ/cm.
Striae	Grade C per mil. spec. G174A Has a fine structure when viewed with parallel light.

IMPURITIES OF TYPE 125 FUSED QUARTZ

IMPURITY	Iron Oxide Fe_2O_3	Titanium Dioxide TiO_2	Aluminum Oxide Al_2O_3	Calcium Oxide CaO	Magnesium Oxide MgO	Potassium Oxide K_2O	Sodium Oxide Na_2O	Lithium Oxide Li_2O	Boron B
Average	7	3	140	12	7	4	12	13	< 1.0

BUBBLE SIZES* OF TYPE 125 FUSED QUARTZ

	DIAMETER SIZE OF FINISHED ITEM				
	0″-2″	2″-6″	6″-12″	12″-20″	20″-38″
AVERAGE DIAMETER	.005″	.007″	.010″	.010″	.020″
MAXIMUM DIAMETER	.020″	.030″	.050″	.080″	.200″
AVERAGE OVER ENTIRE PIECE PER CUBIC INCH	5	5	5	5	20
MAXIMUM PER SINGLE CUBIC INCH	10	15	20	20	40

Applicable to bubbles over .004″ diameter.

REFRACTIVE INDEX OF TYPE 125 FUSED QUARTZ AT 20°C.

WAVE LENGTH IN MICRONS	INDEX OF REFRACTION
0.155	1.66044
0.1575	1.64956
0.16	1.6396
0.165	1.62204
0.17	1.60706
0.175	1.59413
0.18	1.58288
0.185	1.57301
0.19	1.56429
0.195	1.55654
0.2	1.54961
0.205	1.54338
0.21	1.53775
0.215	1.53266
0.22	1.52801
0.225	1.52378
0.23	1.51989
0.235	1.51632
0.24	1.51303
0.242	1.51179
0.245	1.50999
0.25	1.50718
0.3	1.48753
0.32	1.48246
0.35	1.47659
0.4	1.46979
0.45	1.46523
0.5	1.46198
0.55	1.45956
0.6	1.45768
0.65	1.45617
0.7	1.45493
0.75	1.45387
0.8	1.45295
0.85	1.45213
0.9	1.45139
0.95	1.4507
1.	1.45005
1.3	1.44656
1.4	1.44542
1.45	1.44485
1.5	1.44426
1.7	1.44183
2.	1.43775
2.15	1.43548
2.25	1.43387
2.35	1.43218
2.4	1.4313
2.6	1.42757
2.65	1.42658
2.7	1.42557
2.75	1.42453
2.8	1.42346
2.9	1.42126
3.	1.41894
3.1	1.41651
3.2	1.41397
3.3	1.4113
3.4	1.4085
3.5	1.40557
3.6	1.4025
3.7	1.39929
3.8	1.39591
3.9	1.39238
4.	1.38867
4.15	1.38278
4.2	1.38071
4.3	1.37644
4.4	1.37195
4.5	1.36724
4.6	1.36229

OTHER TYPES of fused quartz available from General Electric include five optical grades of infrared, ultraviolet or full spectrum. In addition, Type 151 schlieren grade fused silica is available for highly critical ultraviolet and optical applications.

Special assistance on product application

Backing up the variety of products available from General Electric's Lamp Glass Department is a diverse staff of technical research people with wide experience in the field. Ceramists, physicists, chemists and engineers are always available to bring concentrated technical talent to the solution of your application problem whether it involves the use of electronic glass, fused quartz, fused silica or Lucalox® ceramic.

General Electric's Willoughby Quartz Plant houses a vast array of skilled technicians experienced in the fabrication of exotic optical and electronic materials. Painstaking care is applied to every order to assure quality excellence of the highest degree.

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For additional information on these products, contact:

LAMP GLASS DEPARTMENT

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